THEREFORE WHAT IS CLAIMED IS:

1. A hybrid porous material having a porous framework material and pre-selected organic, organometallic, or biological molecules chemically attached to a surface of pores of the porous framework through two or more chemical linkages.

2. The material according to claim 1 in which the porous framework material is a porous metaloxide.

3. The material according to claim 1 in which the porous framework material is a mesoporous metaloxide.

4. The material according to claim 1 in which the porous framework material is a macroporous metaloxide.

5. The material according to claim 1 in which the porous framework material is a mesoporous-macroporous metaloxide.

6. The material according to claims 2, 3, 4 or 5 in which the metaloxide is silica.

7. The material according to claims 2, 3, 4 or 5 in which the metaloxide is selected from the group consisting of oxides of boron, magnesium, aluminum, gallium, germanium, tin, titanium, zirconium, niobium, tantalum, molybdenum, tungsten and mixed metals.

8. The material according to claim 1 in which the porous framework material is a porous organometaloxide.

9. The material according to claim 8 in which the porous organometaloxide is a mesoporous organometaloxide.

10. The material according to claim 8 in which the porous organometaloxide is a macroporous organometaloxide.

11. The material according to claim 8 in which the porous organometaloxide is a mesoporous-macroporous organometaloxide.

12. The material according to claim 8, 9 or 10 in which the organometaloxide is organosilica.

13. The material according to claim 3 in which the mesoporous metaloxide is mesoporous silica selected from the group consisting of MCM41, MCM48 and SBA type mesoporous silica.

14. The material according to any one of claims 1 to 13 in which pore walls of the porous framework material are amorphous.

15. The material according to any one of claims 1 to 13 in which pore walls of the porous framework material are crystalline.

16. The material according to any one of claims 1 to 13 in which pore walls of the porous framework material are partially crystalline.

17. The material according to any one of claims 1 to 13 in which pore walls of the porous framework material are periodically ordered.

18. The material according to any one of claims 1 to 16 in which pores of the porous framework material are disordered.

19. The material according to any one of claims 1to 18 in which the porous framework material is an inverted opal.

20. The material according to any one of claims 1 to 19 in which the pre-selected molecules are silsesquioxanes.

21. The material according to claim 20 wherein the silsesquioxanes are selected from the group consisting of bis(triethoxysilyl)methane; 1,2-bis(triethoxysilyl)ethane, 1,2-bis(triethoxysilyl)ethylene; 1,4-bis(tirethoxysilyl)benzene; 1,3-bis(triethoxysilyl)benzene; 1,3,5-tris(triethoxysilyl)benzene, and combinations thereof.

22. The material according to any one of claims 1 to 21 in which pore walls of the porous framework material are partially covered by the pre-selected molecules.

23. The material according to any one of claims 1 to 21 in which pore walls of the porous framework material are substantially completely covered by the pre-selected molecules.

24. The material according to any one of claims 1 to 23 in which the pre-selected molecules bound to pore walls of the porous framework material are of a single type.

25. The material according to any one of claims 1 to 23 in which the pre-selected molecules bound to pore walls of the porous framework material are of two or more different types.

26. The material according to any one of claims 1 to 25 in which the pre-selected molecules bound to the pore walls to form at least one layer or multiple layers.

27. The material according to claims 1 to 26 in which the linkages between the framework and the pre-selected molecules are Si-O-Si linkages or Si-R-Si linkages.

28. The material according to claims 1 to 27 formed as a powder.

29. The material according to claims 1 to 27 formed as a film.

30. The material according to claims 1 to 27 formed as a monolith.

31. A method of synthesizing a hybrid porous material having a porous framework material and pre-selected organic, organometallic, or biological molecules chemically attached to a surface of pore walls of the porous framework through two or more chemical linkages, comprising the steps of:

a) preparing a porous framework material having pores and pore walls throughout with preselected porosity; and

b) chemically binding pre-selected organic, organometallic, or biological molecules to the pore walls of the porous framework material through two or more chemical linkages.

32. The method according to claim 31 wherein the step of preparing a porous framework material includes synthesizing the porous framework

material by mixing a particulate constituent of the framework material with a suitable supramolecular template under conditions suitable for self-assembly of the particulate constituent to form the framework material, and removing the supramolecular template and the colloidal crystal.

33. The method according to claim 31 or 32 in which the framework material is a metaloxide.

34. The method according to claim 33 in which the suitable supramolecular template is selected to give a porous framework material which is a mesoporous metaloxide.

35. The method according to claim 33 in which the suitable supramolecular template is selected to give a porous framework material which is a macroporous metaloxide.

36. The method according to claim 33 in which the suitable supramolecular template is selected to give a porous framework material which is a mesoporous-macroporous metaloxide.

37. The method according to claims 33, 34, 35 or 36 in which the metaloxide is silica.

38. The method according to claims 33, 34, 35 or 36 in which the metaloxide is selected from the group consisting of oxides of boron, magnesium, aluminum, gallium, indium, germanium, tin, titanium, zirconium, niobium, tantalum, molybdenum, tungsten and mixed metals.

39. The method according to claim 31 or 32 in which the framework material is an organometaloxide.

40. The method according to claim 39 in which the suitable supramolecular template is selected so that the porous organometaloxide is a mesoporous organometaloxide.

41. The method according to claim 39 in which the suitable supramolecular template is selected so that the porous organometaloxide is a macroporous organometaloxide.

42. The method according to claim 39 in which the suitable supramolecular template is selected so that the porous organometaloxide is a mesoporous-macroporous organometaloxide.

43. The method according to claim 39, 40, 41 or 42 in which the organometaloxide is organosilica.

44. The method according to claim 40 in which the mesoporous metaloxide is mesoporous silica selected from the group consisting of MCM41, MCM48 and SBA type mesoporous silica.

45. The method according to any one of claims 31 to 44 in which pore walls of the porous framework material are amorphous.

46. The method according to any one of claims 31 to 44 in which pore walls of the porous framework material are crystalline.

47. The method according to any one of claims 31 to 44 in which pore walls of the porous framework material are partially crystalline.

48. The method according to any one of claims 31 to 44 in which pore walls of the porous framework material are periodically ordered.

49. The method according to any one of claims 31 to 44 in which pores of the porous framework material are disordered.

50. The method according to any one of claims 31to 49 in which the porous framework material is an inverted opal.

51. The method according to any one of claims 31 to 50 in which the pre-selected molecules are silsesquioxanes.

52. The method according to claim 51 wherein the silsesquioxanes are selected from the group consisting of bis(triethoxysilyl)methane; 1,2-bis(triethoxysilyl)ethane, 1,2-bis(triethoxysilyl)ethylene; 1,4-bis(tirethoxysilyl)benzene; 1,3-bis(triethoxysilyl)benzene; 1,3,5-tris(triethoxysilyl)benzene, and combinations thereof.

53. The method according to any one of claims 31 to 52 in which pore walls of the porous framework material are partially covered by the pre-selected molecules.

54. The method according to any one of claims 31 to 52 in which pore walls of the porous framework material are substantially completely covered by the pre-selected molecules.

55. The method according to any one of claims 31 to 54 in which the pre-selected molecules bound to pore walls of the porous framework material are of a single type.

56. The method according to any one of claims 31 to 54 in which the pre-selected molecules bound to pore walls of the porous framework material are of two or more different types.

57. The method according to any one of claims 31 to 56 in which the pre-selected molecules bound to the pore walls to form at least one layer or multiple layers.

58. The method according to claims 1 to 57 in which the linkages between the porous framework material and the pre-selected molecules are Si-O-Si linkages or Si-R-Si linkages.

59. The method according to claims 31 to 58 including a step of forming the hybrid porous material as a powder.

60. The method according to claims 31 to 58 including a step of forming the hybrid porous material as a film.

61. The method according to claims 31 to 58 including a step of forming the hybrid porous material as a monolith.